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TITLE: GEOGRAPHIC AREA TEMPLATES
 FOR COMPUTER GAMES

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1 GEOGRAPHIC AREA TEMPLATES
2 FOR COMPUTER GAMES
3

4 REFERENCE TO RELATED APPLICATIONS

5 The present application is related to copending patent applications entitled
6 "METHOD AND SYSTEM FOR USING GEOGRAPHIC DATA IN COMPUTER
7 GAME DEVELOPMENT", Attorney Docket No. N0184US, "APPLICATION
8 PROGRAMMING INTERFACE FOR GEOGRAPHIC DATA IN COMPUTER
9 GAMES", Attorney Docket No. N0185US, and "COMPUTER GAME
10 DEVELOPMENT FACTORY SYSTEM AND METHOD", Attorney Docket No.
11 N0190US, the entire disclosures of which are incorporated by reference herein.
12

13 BACKGROUND OF THE INVENTION

14 The present invention relates to a system and method that facilitate development
15 of computer games and more particularly, a system and method that facilitate
16 development of computer games that include representations or depictions of simulated
17 real world geographic areas.

18 Computer games have developed in sophistication and commercial importance.
19 Improvements in computer hardware and software have enabled computer games to
20 provide realistic graphics and sound. With these advances, computer game users have
21 come to expect that games meet high standards for richness and attention to detail. For
22 computer games that are intended to represent real world places, such as road race games,
23 users expect the games to provide convincing depictions of the real world, with attention
24 to accuracy and detail.

25 Computer game developers have recognized the need to provide realistic
26 depictions of places in computer games. This has placed a burden on computer game

1 developers to obtain the data needed to portray geographic places with realistic detail and
2 accuracy. The collection of such detailed geographic data about real world roads, places,
3 etc., is time-consuming and expensive. Further, the collection of detailed real world data
4 diverts the resources of computer game developers away from other important aspects of
5 computer game creation, such as characters, story lines, and strategies. Thus, there exists
6 a need to facilitate the collection and use of geographic data by game developers.

7 Another consideration related to the development of computer games is that the
8 computer game developer may not want to depict an actual geographic location. Instead,
9 the computer game developer may want to depict a location that appears similar to an
10 actual location. For example, instead of depicting the actual city of Los Angeles, the
11 computer game developer may want to depict a southern California city that is like Los
12 Angeles. The computer game developer may want to do this for a variety of reasons.
13 One reason is that it relieves the computer game developer of the burden of collecting the
14 large amount of data needed to depict the actual city. Another consideration is that it
15 allows the computer game developer to avoid having game players find discrepancies
16 between the geographic location depicted in the computer game and the actual
17 geographic locations. Still another consideration is that it allows a computer game
18 developer to include advertising and product placements.

19 Even if a computer game developer decides to depict a location that is similar to
20 an actual location instead of the real location, the computer game developer is still faced
21 with the problem of obtaining enough geographic data from which to create the location
22 that is similar to an actual location. Thus, modeling a city similar to Los Angeles
23 requires a significant amount of effort in order to make the simulation realistic.

24 Accordingly, it is an objective to create representations of places that are like real
25 places.

26 It is another objective to facilitate development of a computer games that
27 represent or depict realistic appearing places that are similar to real places.

28

SUMMARY OF THE INVENTION

To address these and other objectives, the present invention includes a system and method for facilitating development of computer games that depict or represent actual, real world geographic areas as part of the play scenarios of the games. A source database contains data that represent geographic features in a region including roads in the region. The data in the source database includes attributes suitable for use for providing navigation-related functions. In addition to providing data from the source database for navigation-related functions, data from the source database are also used to form a template database, wherein the template database represents an imaginary locale. The template database is provided for computer game development.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagram that illustrates a relationship between a master version of a geographic database and a coverage area.

Figure 2 is a block diagram showing a first embodiment of a system for facilitating development of computer games using a template derived from the geographic database of Figure 1.

Figure 3 is a flowchart of steps in a process performed by the template compiler of Figure 2.

Figure 4 is a block diagram showing components of a system used by a computer game developer that uses the geographic template produced by the process of Figure 3.

Figure 5 is a block diagram showing a second embodiment of a system for facilitating development of computer games using a template derived from the geographic database of Figure 1.

Figure 6 is a flowchart of steps in a process performed by the template compiler of Figure 5.

Figure 7 is a block diagram showing components of a system used by a computer game developer that uses the geographic template produced by the process of Figure 6.

Figure 8 is a block diagram showing another embodiment of a system for facilitating development of computer games using a template.

1 DETAILED DESCRIPTION OF THE
2 PRESENTLY PREFERRED EMBODIMENTS

3 I. SOURCE GEOGRAPHIC DATABASE.

4 Figure 1 shows a master or source version of a geographic database 100. The
5 master version of the geographic database is owned and developed by a geographic
6 database developer 101 (also referred to as a “map developer”, a “map data developer” or
7 the like). (Although only one source database and geographic database developer are
8 shown, the embodiments disclosed herein are not limited to only a single source database
9 or a single geographic database developer.)

10 The master version of the geographic database 100 contains data 102 (also
11 referred to a “geographic data” or “spatial data”) that represent geographic features in a
12 coverage area 104. The coverage area 104 may correspond to an entire country, such as
13 the United States. Alternatively, the coverage area 104 may correspond to several
14 countries, such as the United States, Canada, and Mexico, or France, Germany, and Italy,
15 and so on. According to another alternative, the coverage area 104 of the master version
16 of the geographic database 100 may represent only a single region within a country, such
17 as the West Coast or the Midwest of the U.S. Although the master version of the
18 geographic database 100 includes data that represent geographic features in the entire
19 coverage area 104, there may be parts of the coverage area 104 that contain geographic
20 features that are not represented by data in the geographic database, or for which the
21 representation of geographic features is sparse.

22 The master version of the geographic database 100 includes data about a road
23 network 120 located in the coverage area 104. The data about the road network 120
24 include various kinds of information, such as the geographic coordinates of positions of
25 the roads, street names of the roads, addresses ranges along the roads, turn restrictions at
26 intersections of roads, and so on. The master version of the geographic database 100 also
27 includes data about points of interest in the covered area 104. Points of interest may
28 include hotels, restaurants, museums, stadiums, offices, automobile dealerships, auto
29 repair shops, etc. The master version of the geographic database 100 may include data
30 about the locations of these points of interests. The master version of the geographic

1 database 100 may also include data about places, such as cities, towns, or other
2 communities, and other geographic features, such as bodies of water, mountain ranges,
3 etc. The master version of the geographic database 100 may include other kinds of
4 information.

5 There are different ways used by the geographic database developer to collect
6 data. These ways include obtaining data from other sources, such as municipalities. In
7 addition, the geographic database developer may employ field personnel to travel by
8 vehicle along roads throughout the geographic region to observe features and record
9 information about them. The data collected by the geographic database developer are
10 stored in the master version of the geographic database 100.

11 The geographic database developer 101 continues to collect data that represent the
12 features in the geographic coverage area 104 on an ongoing basis. One reason that the
13 geographic database developer continues to collect data is that the features in the
14 coverage area 104 change over time. Accordingly, the geographic database developer
15 collects data about the same features in order to update or confirm the previously
16 collected data about the features. Another reason that the geographic database developer
17 continues to collect data is to expand the coverage and/or detail of the master version of
18 the geographic database 100. For example, at one point in time the master version of the
19 geographic database 100 may include data that represents only a portion of the entire
20 coverage area 104. After that point in time, the geographic database developer collects
21 data about features in areas that were not previously represented in order to expand the
22 coverage of the master version of the geographic database 100.

23 The master version of the geographic database 100 is maintained as the copy that
24 has the most up-to-date data relating to the coverage area 104. Accordingly, the master
25 version of the geographic database 100 is updated, expanded, and/or otherwise modified
26 on a regular and continuing basis. To facilitate these operations, the master version of the
27 geographic database 100 is stored in a format that facilitates updating, maintenance, and
28 development. For example, the data in the master version 100 may be uncompressed.
29 Examples of suitable formats include the VSAM format and the GDF format, although

1 other kinds of formats, both proprietary and non-proprietary, may be suitable. In general,
2 the format of the master database 100 is not suitable for use in navigation systems.

3 A copy of the master version of the geographic database 100 is physically located
4 at a first location 114. In one embodiment, the master version of the geographic database
5 100 is stored on one or more hard drives, tapes or other media, and accessed with an
6 appropriate computer 116. Any suitable computer may be used, such as a mainframe
7 computer, a plurality of networked microcomputers, etc.

8 9 II. FIRST EMBODIMENT

10 Figure 2 shows an overview of a first embodiment of a system and method for
11 facilitating the development of computer games using a template that includes
12 representations of geographic features that are similar to actual geographic features. In
13 Figure 2, the master version of the geographic database 100 is used to make compiled
14 database products 110. The compiled database products 110 are made using a compiler
15 111. The compiler 111 is a software program run on an appropriate computer platform.

16 The compiled database products 110 may include only portions of all the data in
17 the master version of the geographic database 100. For example, the compiled database
18 products 110 may include data that relate to only one or more specific sub-areas within
19 the coverage area 104 of the master version of the geographic database 100. Further, the
20 compiled database products 110 may include fewer than all the data attributes that
21 describe geographic features represented in the master version of the geographic database
22 100.

23 The compiled database products 110 are used on various kinds of computing
24 platforms. For example, the compiled database products 110 are used in computing
25 platforms 112 used for navigation. The computing platforms 112 used for navigation
26 include in-vehicle navigation systems, hand-held portable navigation systems, personal
27 computers (including desktop and notebook computers), and other kinds of devices, such
28 as personal digital assistant (PDA) devices, pagers, telephones, etc. The compiled
29 database products 110 are also used on networked computing platforms and
30 environments, including systems connected to the Internet.

1 The compiled database products 110 that are used in computing platforms used
2 for navigation are stored on suitable media. For example, the compiled database products
3 may be stored on CD-ROM disks, hard drives, DVD disks, flash memory, or other types
4 of media that are available now or that become available in the future.

5 On the computing platforms 112 used for navigation, the compiled database
6 products 110 are used by various software applications. For example, the compiled
7 database products 110 may be used by software applications that provide navigation-
8 related functions, such as route calculation, route guidance, vehicle positioning, map
9 display, and electronic yellow pages, as well as other kinds of functions.

10 As stated above, a computer game developer may not want to depict an actual
11 geographic locale, but instead may want to depict a geographic locale which is similar to
12 an actual locale. Therefore, in addition to producing compiled database products 110 for
13 use on computing platforms used for navigation, the geographic database developer 101
14 produces one or more geographic template products 200 for use by a computer game
15 developer 130. In a present embodiment, the geographic template products 200 are
16 produced by the geographic database developer 101 using a template compiler program
17 204, which is described in more detail below. The geographic template products 200
18 used by the computer game developer 130 may be similar to compiled database products
19 110 used in the computing platforms 112 used for navigation, except that the geographic
20 template products 200 do not represent actual real world places. The geographic template
21 products 200 may be provided on a suitable media, such as one or more CD-ROM disks,
22 DVD disks, or hard drives. Alternatively, the geographic template products 200 may be
23 provided over a network connection.

24 Figure 3 shows steps in a process 208 performed by the template compiler
25 program 204 for making a geographic template product 200 for use in a computer game
26 that depicts or represents an imaginary geographic locale as part of the play scenario of
27 the game. In this embodiment, the process 202 is performed by the geographic database
28 developer 101.

29 The imaginary geographic locale represented by the geographic template product
30 may be locale that is similar to one or more actual locales. For example, the imaginary

1 locale may be a southern California city. The imaginary geographic locale may also be a
2 fantasy locale. The imaginary geographic locale may also be an actual locale but set at a
3 different historical period (past or future) than the present.

4 In a first step of the process 208, one or more geographic locales are selected
5 (Step 212). In this step, the locales may include metropolitan areas, such as a southern
6 California metropolitan areas like the Los Angeles metropolitan area or the San Diego
7 metropolitan area. Alternatively, the locales may include metropolitan areas, such as
8 Midwestern metropolitan areas like the Chicago metropolitan area and the Detroit
9 metropolitan area. These locales may be selected manually, e.g., by a human operator
10 selecting the areas. Alternatively, the locales may be selected automatically using a
11 computer program that automatically uses the data in the master geographic database 100
12 to select locales within a selected region that have similar geographic characteristics like
13 road density. For example, if an operator selects a region, e.g., southern California, a
14 program automatically identifies major urban areas in the region.

15 Once the geographic locales have been selected, data that represent the locales are
16 obtained from the geographic database 100 (Step 214). In one embodiment, all the data
17 in the master geographic database 100 that represent the selected locales are obtained.
18 Alternatively, only some of the data in the master geographic database 100 that represent
19 the selected locales are obtained. For example, only selected attributes that represent the
20 locales may be obtained.

21 After the data that represents the selected locales has been obtained, certain
22 parameters of the geographic locales are determined (Step 220). These parameters
23 characterize the locales. These parameters are obtained by comparison of the
24 corresponding data from the different locales. (If only a single locale is selected in Step
25 212, the parameters are determined from data that represents only the single locale.)

26 Examples of the types of parameters that are determined include the following:

27 Overall size. For example, one parameter that is determined indicates the average
28 overall size of the locales. This parameter may be determined by calculating the average
29 of the overall areas of the locales for which data have been obtained.

1 Road density (by type). Another parameter is a road density distribution. Some
 2 geographic locales have large (in area) sections with densely-spaced streets.

3 Road shape. Another parameter is a road shape. Some geographic locales tend to
 4 have road with lots of curves, whereas other locales tend to roads that are relatively
 5 straight.

6 Road widths. Another parameter indicates the different types of road widths and
 7 the percentage of each type.

8 Expressway density. Some geographic locales have a relatively large number of
 9 expressways.

10 Road orientation. Some locales tend to have roads all aligned in a north-south,
 11 east-west grid pattern.

12 Road alignment. Some locales tend to have a lot of roads that do not meet at right
 13 angles.

14 Altitude variety. Some locales tend to have many altitude changes, e.g., lots of
 15 hills.

16 Geographic features. These parameters indicate the types, sizes, shapes, number
 17 of geographic features, such as lakes, rivers, mountains, etc.

18 Open spaces. This parameter indicates the type, number, size, density, etc., of
 19 open spaces in a locale. These may include parks, golf courses, etc.

20 POIs. This parameter indicates the types, density, number, etc. of the points of
 21 interest in the locales. These points of interest include businesses, government buildings,
 22 monuments, stadiums, airports, etc.

23 Buildings. This parameter indicates the types, sizes, shapes, etc., of the buildings
 24 located in a locale.

25 Signage. This parameter indicates the types of signs, the text on different signs,
 26 sign shape, sign layout, the density and placement of signs, etc.

27 There may be other parameters that are determined in addition to these. A
 28 parameter can be determined for any type of data contained in the geographic database
 29 100.

1 Once the parameters have been determined for the locales in the selected region, a
2 template 222 is formed (Step 224). The template has a structure similar to a geographic
3 database that represents an actual region. However, the template does not represent an
4 actual locale. Instead, the template is based on the parameters so that its characteristics
5 are similar to those of all the locales in the selected region. For example, if the selected
6 region is southern California, and the selected locales include Los Angeles and San
7 Diego, a parameter for expressway density would indicate relatively many expressways
8 per square mile. A template formed for this region would have an expressway density
9 that corresponds to this parameter.

10 One way to form the template database is to start with one of the actual databases
11 and transform the data. For example, starting with a database that represents Los
12 Angeles, each data entity representing a road segment (or groups of data entities
13 representing groups of road segments) would be modified to alter the location of the
14 represented road segment. Some techniques that may be employed to form the template
15 database from the actual database include moving the locations of roads by varying
16 distances, switching the relative vertical ordering of roads that cross each other at
17 different elevations, forming mirror images of roads located in an area, performing
18 horizontal or rotational transformations of the location of groups of roads, and so on.
19 Quality assurance testing would be used to insure that the modification maintained
20 database integrity, including connectivity of the modified road network.

21 A similar process would be used for data that represented other kinds of
22 represented features, such as points of interest, geographic features, such as lakes, rivers,
23 etc., buildings, and so on.

24 Once this information has been prepared and stored in the template geographic
25 database, names are determined for the represented geographic features (Step 228). In
26 determining street names, a thesaurus function may be used to obtain similar names that
27 correspond to real world names. For example, if streets in the real world database are
28 named "Oak" and "Pine", the template database may include corresponding streets
29 named "Elm" and "Poplar."

1 After the name information is added to the template 222, other compilation steps
2 may be performed on the template 222. These other compilation steps may be similar to
3 the steps performed on the geographic database products 110 used for navigation
4 purposes.

5 The template 222 is provided to the game developer 130. The template 222 is
6 used by the computer game developer 130 in a similar manner as an actual geographic
7 database would be used. The computer game developer 130 uses the template 222 data,
8 along with other data and components, to create one or more computer games 132.

9 In creating computer games 132, the computer game developer 130 may include
10 some or all the data from the template 222. Alternatively, the computer games 132 may
11 include data derived from or based on data from the template 222. The geographic data
12 in the computer game 132 eventually produced by the computer game developer 130 may
13 be in a different format than the data contained in the template 222.

14 Referring to Figure 4, the computer game developer 130 may use a geographic
15 data API (application programming interface) 140 and geographic data tools 144 to
16 access and use data contained in the template 222. In one embodiment, the API 140 and
17 data tools 144 are similar or identical to the interface layer and related navigation
18 applications described in U.S. Pat. Nos. 5,974,419, 5,953,722, 5,968,109 and 6,047,280,
19 the entire disclosures of which are incorporated by reference herein. In general, the
20 geographic data API 140 provides a library of functions that facilitate accessing the data
21 contained in the template 222.

22 The geographic data API 140 and data tools 144 provide various ways that the
23 data in the template 222 can be accessed. Some of the ways the geographic data API 140
24 and data tools 144 provide for accessing the geographic database 118 are described in the
25 copending application entitled, "METHOD AND SYSTEM FOR USING GEOGRAPHIC
26 DATA IN COMPUTER GAME DEVELOPMENT", Attorney Docket No. N0184US, the
27 entire disclosure of which is incorporated by reference herein.

28 Using the geographic data API 140 and data tools, the game developer combines
29 the template 222 with road model data (which adds visual representations of various
30 road-related things, such as lampposts, lane markers, pavement colors, and so on), 3D

1 model data (which add buildings, trees, etc.) and other game related components (such as
2 characters, game logic, vehicles, game rules, and so on). In the computer game product,
3 the template may be integrated into the code base or may exist separately.

4 The computer games 132 created using the data from the template 222 provide for
5 representing geographic features in play scenarios of the computer games. The
6 geographic features depicted by the computer games do not represent actual, real world
7 geographic features, but are similar to the kinds of actual features that a person would
8 find in a typical locale in a given geographic region. These depicted features include a
9 road network, which is similar to the kind of road network a person would find in a
10 typical locale in the given geographic region. This simulated road network in the
11 template can be provided with the same level of accuracy and detail as a real road
12 network.

13 The computer games 132 produced using the geographic template 222 are
14 installed on appropriate computer platforms 134. The computer platforms 134 on which
15 the computer games 132 are installed may include personal computers, game consoles,
16 PDAs, handheld game devices, mobile phones, networked computers, and so on. Users
17 access the computer games 132 on the computer platforms 134 to play the games.

18 19 III. SECOND EMBODIMENT

20 Figure 5 shows a second embodiment of a system for developing a computer
21 game using a template that contains data that represents a simulation of real world
22 geographic features of the current time or of past or future times. Figure 6 shows a
23 flowchart of a process 308 performed by the system of Figure 5. The process 308 can be
24 performed by the map developer 101 in Figure 5 using the template compiler 304 in
25 Figure 2. The process 308 of Figure 6 is similar to the process 208 of Figure 3, and like
26 steps are indicated by the same numerals.

27 The process of 308 in Figure 6 differs from the process 208 in Figure 3 in that
28 after a basic geographic template is formed using data that represents actual geographic
29 features in actual locales (Step 228 or 232), additional data is added to the basic template
30 by the map developer 101. In this embodiment, the additional data that may be added to

1 the template includes road model data obtained from a road model database 170 and 3D
2 model data obtained from a 3D model database 174. (In the first embodiment described
3 in connection with Figures 3 and 4, road model data and 3D model data are added to a
4 geographic template by the game developer.)

5 The data in the road model database 170 are representations used for visual
6 appearance and rendering of road-related things, such as road pavement, lane stripes,
7 curbs, sidewalks, signs, lampposts, lane dividers, traffic signals, speed bumps,
8 crosswalks, and so on. These road model representations are associated with data
9 representation of the simulated road network formed in the first part of the process 308.
10 As stated above, the data representation of the simulated road network formed in the first
11 part of the process 308 is derived from representations of road networks used for
12 navigation. As such, the data representation of the simulated road network formed in the
13 first part of the process 308 may not indicate what roads, or things associated with a road,
14 look like. For example, the data representation of the simulated road network formed in
15 the first part of the process 308 may indicate the locations (e.g., geographic coordinates)
16 of intersections, and possibly the locations of points along a road segment between
17 intersections, the legal (and illegal) connections between roads, the names of roads, the
18 addresses ranges along roads, the type of road surface, and so on. However, in the data
19 representation of the simulated road network formed in the first part of the process 308
20 may not contain information that indicates the actual visual shapes, colors, dimensions,
21 etc., of these road-related things. For example, the data representation of the simulated
22 road network formed in the first part of the process 308 may not indicate the colors of a
23 road, curbs, sidewalks, what a sign looks like, and so on. The road model database 170
24 includes these types of information.

25 An integration step (Step 364 in Figure 6) provides for associating data in the road
26 model database 170 with data from the representation of the simulated road network
27 formed in the first part of the process 308. The integration step 364 may associate road
28 model data with specific locations along a road segment (as represented in the data
29 representation of the simulated road network formed in the first part of the process 308)
30 or with lengths along such a road segment. As an example, the integration step 364 may

1 provide for showing curbs (using a model for what a curb looks like from the road model
2 database 170) along all side streets (represented by data from the representation of the
3 simulated road network formed in the first part of the process 308). In another example,
4 the integration step 364 may provide for showing barriers along all the sides of
5 expressways (using a model for barriers from the road model database 170) as
6 represented by data from the template. The integration step 364 may also provide for
7 associating data models for traffic signals at simulated intersections represented in the
8 template formed in the first part of the process 308.

9 The data representations of road-related things in the road models database are
10 also used for providing other properties of the represented things, such as the physical
11 and audio properties. For example, causing a simulated vehicle to move over a simulated
12 curb causes the simulated vehicle to “bump.” Similarly, a simulated vehicle “hitting” a
13 simulated lamppost causes a simulated crashing sound.

14 The road model database 170 may include a variety of different data models for
15 some types of road-related things. For example, there may be a number of different types
16 of traffic signal configurations. These different types of traffic signal configurations are
17 used to provide variety and to make the representation of the road network appear more
18 realistic, i.e., so that all the traffic signal configurations do not look the same.

19 The map database developer 101 uses the integration step 364 to combine data
20 from the road model database 170 with the representation of the simulated road network
21 formed in the first part of the process 308 to provide a realistic appearing road network.
22 The road model database 170 is not intended to represent the actual road-related things,
23 such as the exact locations of or text on signs, or the exact configuration of traffic signals,
24 etc. Neither the basics template formed in the first part of the process 308 nor the road
25 model database may contain information that represents the actual location of signs or the
26 exact configuration of traffic signals. However, the road model database 170 provides
27 data for visually representing these road-related things in a manner that would be typical
28 for the geographic area. So, for a residential neighborhood, the road model database
29 would include models for sidewalks, cross walks, stop signs, etc., which would be
30 associated with appropriate locations along the representation of the simulated road

1 network formed in the first part of the process 308. The integration step 364 and the road
2 model database 170 provide for both the density (how many signs per mile or how many
3 lampposts per block) and the style (shape, height, sign text wording) of these road related
4 things.

5 As mentioned above, the integration step 364 associates data from the 3D model
6 database 174 with the representation of the simulated road network formed in the first
7 part of the process 308. The 3D model data in the 3D model database 174 includes
8 representations used for visual appearance and rendering of cityscape- and landscape-
9 related things, such as buildings fences, trees, shrubbery, lawns, fences, clouds, scenery,
10 and so on. The 3D model database may also include information such as POI types,
11 business/residential zones, socio-economic information, etc. Like the road models, these
12 3D model representations are associated with locations along the simulated road network
13 data representation contained in the template formed in the first part of the process 308.

14 The data representations of cityscape and landscape-related things in the 3D
15 models database are also used for providing the other properties (e.g., physical and audio)
16 of the represented things. For example, causing a simulated vehicle to strike a simulated
17 building causes the simulated vehicle to stop and make a crashing sound. As another
18 example, a simulated vehicle can drive over a simulated shrub, but not a simulated tree.

19 After the geographic database developer 101 has integrated the data
20 representation of the simulated road network formed in the first part of the process 308
21 with the data from the road model database 170 and 3D model database 174, as
22 appropriate, an enhanced template data product 300 is produced. This enhanced template
23 300 is provided to the game developer 130.

24 Referring to Figure 7, the game developer 130 uses the enhanced template 300 to
25 produce computer games. The game developer 130 combines the enhanced template 300
26 with other game-related components and inputs 190. Among the other game-related
27 components and inputs 190 are data and programs that provide and/or represent
28 characters, game logic, vehicles (both for the first person game player as well as others),
29 and game rules. The other game-related components and inputs 190 also include
30 programs for rendering and graphics. The other game-related components and inputs 190

1 may also include components (e.g., applications, programs, etc.) that make specific use of
2 the geographic data, such as a route calculation application that determines a route that
3 can be used as part of the play scenario of the game. The development of some computer
4 games may include additional components and/or inputs whereas other computer games
5 may require fewer. Creation and development of these game-related components and
6 inputs are known to those of skill in the art. The game developer 130 combines enhanced
7 template 300 with the other game-related components and inputs 190 using a suitable
8 linker and/or compiler 194. The computer game 134 produced by the computer game
9 developer 130 is distributed (and/or sold or licensed) to end users using any suitable
10 distribution channels.

11 12 IV. THIRD EMBODIMENT

13 Figure 8 shows another embodiment of a system for developing computer games
14 using templates that contains data that represents simulations of real world geographic
15 features of the current time or of past or future times. The system of Figure 8 is similar to
16 the system of Figure 2 or the system of Figure 5, and like components are indicated by
17 the same numerals. The system in Figure 8 differs from the other systems in that
18 geographic templates are provided to the end users. The geographic templates that are
19 provided to the end users may be the same as, or similar to, the geographic templates
20 described above in the other embodiments. The geographic templates may be provided to
21 the end users directly from the map developer or alternatively the geographic templates
22 may be provided to the end users from the game developer. The end users use the
23 geographic templates to help create their own geographic databases for use in their own
24 computer games. According to this embodiment, end users could create their own data
25 models of buildings, scenery, characters, vehicles, etc., based on real world or imaginary
26 places, and combine these data models with templates of their own choosing. The end
27 users may create their own data models or may insert other data from other sources, such
28 as freeware, custom design studios, third parties, etc. The process by which end users
29 combine their data models with geographic templates would be similar to those processes
30 described above by which data models are combined with geographic templates by the

1 map developer or the game developer. Suitable applications and programming tools
2 would be made available to end users for this purpose. In one embodiment, an
3 application programming interface (API) would be used in an end user's computer game
4 to access a geographic template which had been provided to the end user. An application
5 programming interface suitable for this purpose is described in the copending patent
6 application entitled "APPLICATION PROGRAMMING INTERFACE FOR
7 GEOGRAPHIC DATA IN COMPUTER GAMES", Attorney Docket No. N0185US, the
8 entire disclosure of which is incorporated by reference herein. End users would be able
9 to use the geographic templates, with their added data models, in their computer games,
10 as described above.

11

12 V. ALTERNATIVES

13 In the embodiments disclosed above, it was described how template geographic
14 databases could be developed so that the imaginary places represented by the template
15 geographic databases resembled or possessed the style of types of actual, real world
16 places, such as southern Californian city. In alternative embodiments, template
17 geographic databases can be developed that represent other types of imaginary places,
18 such as fantasy places or historical (past or future) actual places. For example, using an
19 embodiment disclosed herein, a template geographic database can be developed that
20 represents New York City in the 1930's.

21 The embodiments disclosed herein describe use of geographic data in computer
22 games. The embodiments disclosed herein can be adapted for using geographic data for
23 other non-navigation-related purposes. Among these other, non-navigation purposes are
24 simulations and movie making. For example, the embodiments disclosed herein can be
25 adapted for using geographic data for simulation systems. Simulation systems that can
26 use geographic data include systems that simulate emergency operations (such as
27 evacuation procedures or emergency vehicle deployment and routing), driver education
28 systems, etc. When using any of the disclosed embodiments for movie making, a
29 relatively high visual accuracy may be required and therefore attributes that provide for

1 relatively high visual accuracy may be needed. However, fewer attributes of some types
2 may not be required.

3 The embodiments disclosed herein can also be used in movie making. Many
4 movies use computer-generated images of real (or imaginary) locations, instead of actual
5 images. The embodiments disclosed herein can be adapted for creating realistic-looking
6 geographic locations, including features such as road networks, for use in movie making.

7 The embodiments disclosed herein can be used on various different types of
8 computer platforms, including client-server platforms and peer-to-peer platforms. The
9 embodiments disclosed herein can be used with streaming or other technologies.

10 The embodiments disclosed herein may also be used for games that use
11 geographic data obtained from multiple sources, e.g., more than one source geographic
12 database. In these embodiments, the data from the multiple source geographic databases
13 may be combined by the game developer or by another party.

14 In the embodiments disclosed above, it was described how a template that
15 represents an imaginary locale for use in computer games could be derived from data that
16 represents actual geographic places and which is used for other non-game-related
17 functions. In an alternative embodiment, a template for use in computer games may be
18 derived from data collected specifically for the purpose of use in computer games.
19 According to this embodiment, the template could represent an actual or an imaginary
20 locale and would be sold or licensed to game developers for use in computer games.

21

22 VI. ADVANTAGES

23 The disclosed embodiments solve a problem facing the computer game industry,
24 namely the need to expend significant resources to gather geographic information for use
25 in individual game titles.

26 As mentioned above, the templates provided by the disclosed embodiments may
27 include more than road network data and may include such items as 3D building views,
28 POI types, business/residential zones, socio-economic information, etc.

29 The template disclosed herein is a new product. The template may be used to
30 provide what a typical European or Mid-West United States city looks like. The template

1 would depict the typical POI placement in relation to other POIs and residential
2 buildings, how its streets regulate traffic, and how newer cities tend to be designed
3 differently than older cities, etc.

4
5 VII. EXAMPLES

6 The following are examples of different types of computer games and/or
7 applications that can be developed using the disclosed embodiments. (Note that some of
8 the games are new and some are updates and/or improvements of prior games.)

9
10 A. City development simulation game

11 Geographic data that represents actual, real-world locales can be used in a type of
12 computer game in which players simulate growth of an urban (or other regional)
13 environment. In this kind of game, players simulate building cities or other places (such
14 as towns, countries, rural areas) by designing roads, utilities (e.g., electrical, sewage,
15 water) and other infrastructure elements for a geographic area. Then, the computer game
16 allows a virtual city to develop based on the designs. The virtual cities can be detailed
17 including individual zoning requirements (e.g., residential, commercial, industrial, etc.),
18 crime layers (i.e., that can be changed by implementing police stations), traffic,
19 unemployment and other realistic features.

20 Geographic data that represents actual, real-world locales can be used in this type
21 of game to provide a high level of realism thereby allowing game players to build cities
22 based on real world city models. In this type of game, players may choose a specific city
23 model (e.g., Paris), and attempt to improve or replicate it. The inclusion of real time
24 traffic, weather, points of interest (periodically updated or real time) and other real world
25 content would serve to increase the realism of such a virtual city. This improvement
26 could add realism, player loyalty, recognition, and an alternative goal to this popular type
27 of game.

1 B. Virtual person development simulation game

2 Geographic data that represents actual, real-world locales can be used in a type of
3 computer game in which game players simulate development of a virtual person (e.g., a
4 “sim”). In this kind of computer game, players build a virtual person by managing that
5 virtual person’s habits, tendencies, house, family, job and interactions with other virtual
6 people. In prior simulation games of this type, the locales in which virtual people live
7 were non-specific. In prior simulation games of this type, the locales were modeled from
8 the view of the player’s virtual house and may have included some features specific to
9 the game manufacturer.

10 Data from a source of geographic data that represents actual, real-world locales
11 can be used in this type of game to provide a high level of realism, thereby allowing
12 players to build virtual characters in models of real cities, with models of actual real-
13 world points of interest, streets, landmarks and neighborhoods. When starting this type
14 of game, which has been enhanced by the addition of geographic data that represents
15 actual, real-world locales, a player chooses a real world city. Once the city has been
16 chosen, neighborhoods from the city become available for the player to select (e.g.,
17 Chicago’s Gold Cost, Lincoln Park, Rogers Park, River North, or specific suburbs).
18 Once the player selects a neighborhood, the player’s virtual person would be able to
19 simulate visits to virtual attractions based on real world local attractions, e.g., go to
20 popular restaurants and bars, work in local businesses, and reflect how life is lived in that
21 specific area almost as if he/she were living there.

22
23 C. “Bot-fighter” game

24 Geographic data that represents actual, real-world locales can be used as a
25 backbone for a “bot-fighter”-type game. This enhances the bot-fighter-type game by
26 incorporating detailed spatial data that represents real world locales. A “bot-fighter”-type
27 game can be played on mobile phones. In this game, players build “warrior robots” on
28 their mobile phones using credits (e.g., virtual money) from battles won against other
29 players. All firing between warriors is done via SMS messaging over the mobile phones.
30 With mobile phone technology, a player may be given rough coordinates to his or her

1 player-enemies or be warned when a player-enemy has entered his/her area or turf via
2 mobile phone positioning technology.

3 The addition of geographic data that represents actual, real-world locales can give
4 this type of game greater appeal. Specific route data and location details or spotting
5 could be provided instead of simple proximity alerts. The addition of geographic data
6 that represents actual, real-world locales would enable this type of game to support more
7 precise boundaries. Further, with the addition of geographic data that represents actual,
8 real-world locales, a game player's weapons could be given more accurate range
9 limitations, rather than rough limitations available with existing games.

10 In addition, game credits (e.g., virtual money) could be spent on routes, enemy
11 interception (based on known movements or historical patterns) courses, or enemy
12 spotting locations.

13 14 D. Traffic management game/application

15 In this computer game/application, data that represents the road network in the
16 real world is used in combination with traffic feeds and models in order to simulate a real
17 city with its existing traffic patterns. Once a model of an actual city with its road network
18 and traffic patterns is created, predictive modeling and comparisons to other cities allow
19 the user to tweak, re-model, or re-design traffic architecture to improve the road network
20 with the objective to create the most efficient traffic system or to make the most
21 improvements to an existing system.

22 This computer game/application can include a vehicle fleet management feature.
23 According to this feature, the game player is given a virtual fleet of vehicles (e.g., starting
24 with two trucks) in an initially chosen city and an overlay of existing traffic conditions.
25 The goal of the game with the fleet management feature would be to provide service to a
26 customer base (i.e., based on real world businesses represented in the real world
27 geographic database and some zoning data). Time of day for delivery, fleet routing, fuel
28 expenditures, pickup points and schedules etc., would all be managed by the game player.

29 Traffic flow, incidents, bottlenecks and other traffic data would be displayed.
30 Wired or live devices would also have the ability to add live or updated data. Traffic

1 would be made up from individual vehicles, following typical vehicle movement patterns
2 (e.g., gapers, cars driving down the shoulder, etc.) or could be built from scratch.

3
4 E. Emergency services and law enforcement games

5 Geographic data that represents actual, real-world locales can be used in
6 emergency services scenario-type games or law enforcement scenario-type games. These
7 games include themes related to fire fighting, medical emergency services (e.g.,
8 ambulance, search and rescue), police chases, etc. Game developers who make these
9 kinds of games can use the disclosed embodiments to provide realistic looking locales,
10 possibly with the addition of location-based content (e.g., actual buildings, businesses
11 etc.), traffic, weather, points of interest, etc., as part of the playing scenarios of these
12 games.

13
14 F. Location quiz game

15 Geographic data that represents actual, real-world locales can be used in a
16 location quiz-type of computer game. In this type of game, game players are provided
17 with clues about a game character's secret location and attempt to determine the secret
18 geographic location. Using geographic data that represents actual, real-world locales
19 adds a measure of realism to this type of game and increases its educational value.

20 One feature of this game is the ability to personalize the game to a player's locale.
21 Players would be able to search for the secret location in their own city or neighborhood.
22 For example, parents could use the game to teach their children how to get around in their
23 own neighborhoods. According to this example, parents could set up the game to include
24 the route that their child takes to and from school. Also, if a family moves to a new
25 neighborhood, the parents could obtain up-to-date digital map data that represents the
26 new neighborhood in order to teach their children about the new neighborhood.

27 Adding digital map data to the game would also provide the capability to play it
28 anywhere the player is located. For example, a child from Chicago who is on vacation in
29 Paris could search for the game character in Paris and thereby learn about the city.

30

1 G. Children's atlas

2 Another computer game/application that can use geographic data that represents
3 actual, real-world locales is a children's atlas game/application. This computer
4 game/application can be used by families on long car trips. In one embodiment, this
5 game/application could be used to answer children's questions such as "Are we there
6 yet?" or "Where are we?" with distances and times to destinations.

7 One version of this game includes a communications feature that allows a child to
8 communicate with other children who have games with the same feature. Another
9 version of this game/application allows a game player to create a virtual travelogue that
10 describes and records travels in real time.

11 In one embodiment, a children's atlas game/application would be developed as a
12 travel companion game that obtains location information from an in-vehicle navigation
13 system or remote server. As a car in which the child is a passenger drives through a
14 specific locale (e.g., a town or attraction) or a more general area (e.g., a state), the
15 children's atlas application would display images and use voice narration to provide facts
16 about the area. The children's atlas game/application would also provide well-known
17 stories or legends about an area (e.g., Johnny Appleseed as the child is traveling through
18 the Appalachians).

19 In another alternative embodiment, the children's atlas includes a travel pal
20 feature. This feature allows a child traveling through an area to connect online with other
21 children who located in the area. In one version of this feature, children can
22 communicate with other traveling children or with other children located in the area a
23 child is passing through using instant messaging. A buddy list may be formed and used
24 for this purpose. Children could access this service while traveling or at home. For
25 example, children could exchange information about their travels or play games.
26 Children passing through a particular place could instant message with children living in
27 the area and ask questions about the area, e.g., what do the locals think about the best
28 places to eat, what is the best radio station, etc.

29 According to another alternative embodiment, the children's atlas application
30 includes a virtual travelogue feature. The virtual travelogue feature allows a child to

1 collect, store, and send information about his or her travels as a trip is taking place. The
 2 child could take information provided by the atlas game/application, annotate it with
 3 personal experiences and observations, and send it to friends and relatives, or to a home
 4 website that eventually turns into a scrapbook of the entire trip (or perhaps a report on a
 5 school field trip), complete with maps, pictures and postcards from the area, voice
 6 narration, and any other data collected along the way.

7 The virtual travelogue feature could also catalogue and automatically store every
 8 place the child has traveled. The child could then display or print out a map that shows all
 9 the places he or she has been and how he or she got there.

10 11 H. Simulated tour

12 Another application that can use geographic data that represents actual, real-world
 13 locales is a simulated tour application. This simulated tour application uses geographic
 14 data, POI data, 3D modeling, and other data, such as weather, traffic, crime statistics, and
 15 restaurant guides, to build a realistic view of a city or other locale for virtual touring. The
 16 simulated tour application could be used by people considering moving to a new area, or
 17 could be hosted by realtors, or used by travelers, or simply used by individuals to learn
 18 more about different locations.

19 With this application, one can learn, understand, explore, or market a specific
 20 area. This application would portray an area visually, textually, and possibly even
 21 audibly. Smells (e.g., heavy fog, chocolate factory nearby – pervasive) could be provided
 22 using appropriate technology or described textually.

23 One use for this application is to provide a way for a person to become familiar
 24 with driving in an unfamiliar city. Some cities may have driving conventions that are
 25 unfamiliar to some people. For example, speed limits are painted on the road in
 26 California and Hawaii whereas they are located on little signs in Illinois. According to
 27 another example, traffic is particularly aggressive in Rome and lanes are viewed as
 28 guidelines, not rules etc.

1 I. Car rally challenge game

2 Another computer game that can be improved using geographic data that
3 represents real world places is a car rally challenge-type game. This game can be played
4 in single player or multi-player versions. In this type of game, teams of game players
5 travel actual routes that are sent to them from a central server. The server would store a
6 number of car rally routes and attribute scenarios (e.g., points of interest as checkpoints)
7 for a specific area (e.g., state, city, neighborhood, etc.), and these virtual rally instructions
8 would be sent to the participating drivers and navigators.

9 An organizer's kit could also be offered that would cater to amateur car rally
10 organizations or clubs. The kit would allow an individual or organization to create a
11 customized car rally specific to a city or area. The rally information could be created on
12 the rally organizer's personal computer within a program, or via download from a
13 website. It could then be printed out and handed to the racers or downloaded to a device
14 such as a PDA.

15 The difference between the game and the kit is that the game would send out pre-
16 determined routes and rally features. The routes and features might change regularly but
17 the players would not have a hand in planning or creating the rally scenarios.
18 The kit would provide the basic tools and content to create a rally, thereby allowing the
19 user to add local flavor, degrees of difficulty, or to even recreate a well-known rally
20 course.

21
22 J. Location-based virtual monopoly game

23 Geographic data that represents real world places can be used in a computer game
24 based on the Monopoly board game. In one version of this game scenario, a game
25 player's positions and movements in the real world are tracked, using positioning
26 equipment such as GPS, cell phone triangulation, etc. These movements would be used
27 to define game routes for that player. Then, the routes would be used to identify
28 properties (e.g., actual or fictional) along that route the game player could virtually
29 purchase, rent, etc., as in the classic board game. Real world conditions, such as traffic
30 restrictions, road construction, tolls, etc., would be factored into the game play scenario.

1

2 K. Promotional games and contests

3 Geographic data that represents real world places can be used for promotional
4 concepts (e.g., contests, sales events, and so on). Businesses, such as retailers or
5 restaurant franchises, frequently use special promotions or contests to attract business.
6 Adding location-based data and services to these promotions would allow businesses to
7 better target, reach, and track potential customers, and also add an extra dimension.
8 Promotional tie-ins to location-based data could be developed using a variety of
9 approaches.

10

11 L. Spatial simulator for exercise

12 Data that represents actual, real world places can be used with sports or exercise-
13 related events or equipment. For example, geographic data can be used to enhance
14 simulators (e.g., monitors) used on or with exercise equipment. Geographic data that
15 represents real places can be used with a treadmill or exercise bicycle to simulate the
16 experience of running or biking along a route. The route would be projected on a
17 monitor or screen in front of the person on an exercise machine such as a treadmill or
18 exercise bicycle.

19 Use of data that represents actual, real world places could allow users to feel as if
20 they were running through the streets of a major city, e.g., along a marathon or 10K
21 route, or biking the route of the Tour de France. The simulator could also be used to keep
22 track of long-term training goals, such as running virtually across the entire United
23 States.

24 A basic simulation would consist of a display of a basic overview map based on a
25 route. For example, the user would ask for a route within a city and a basic map would
26 be displayed showing the streets of the city with a mark on the map indicating the virtual
27 position of the runner or bicyclist. The runner's progress along the route would be based
28 on the runner's pace. The degree or category of simulation offered could vary depending
29 on the level of realism desired. For example, details such as road elevation could be

1 added to the simulation. This would allow the person exercising to experience the feeling
2 of running or biking in the Rocky Mountains or through the plains of Nebraska.

3 A detailed simulation would use 3D data and give a full picture on a monitor of
4 the buildings and landmarks along the route. This would give the runner or bicyclist a
5 realistic feeling of running or biking along the route.

6

7 M. Classic computer games

8 Geographic data that represents actual, real-world locales can be advantageously
9 used to make new versions of classic computer games like Snake and Pacman. In these
10 new versions of these games, game players assume the identities of characters in the
11 game. A player uses positioning equipment that determines the player's actual physical
12 positioning the real world. The player also has equipment that provides for wireless
13 communication with a central database. This player becomes a virtual player in a classic
14 game such as PacMan or Snake. The games would be played in either an online
15 competitive mode or a single player (player versus machine) mode. In either case, the
16 player acts as a character in the game. The distance and speed moved by the player would
17 be translated to movement and speed in a virtual world, where the player may accomplish
18 goals within the game or defeat other players. The system would be set up in translated
19 "virtual boards" where a game would consist of an area regulated by the speed of
20 transportation (a "board" for a vehicle can be significantly larger than one for a
21 pedestrian).

22

23 N. Location based cannonball run car racing game

24 Another computer game that can use embodiments of the disclosed system and
25 method for providing geographic data is a "cannonball run" car racing game. This game
26 may be played in multi-player or single player mode. The multi-player mode game may
27 be played online. In the game playing scenario, players compete against each other to
28 race vehicles (e.g., cars, bikes, etc.) across a geographical area. Data that represent
29 actual, real-world places would be used to add realism to the game, e.g., actual legal and

1 physical restrictions. Alternative features include the addition of real-time traffic and
2 weather conditions.

3 One scenario for a multi-player online version of the game would feature a
4 community where players start out with a specific mode of transportation. This version
5 of the game would provide an online culture and goal of being with the best group and
6 driving the best vehicle. Players would start with a certain amount of virtual cash and a
7 basic vehicle. Some races would be pre-defined events, whereas other races would be
8 random city races with a user defined start and end points. The selection of routes for
9 races would be based on real map data. The game would be based on winning virtual
10 money by winning races, but winning a race could cost the player due to traffic tickets,
11 illegal traffic maneuvers or other expenses. All fines would be based on legal restriction
12 data and statistics of the percentage of drivers caught. Suggested routes would be
13 provided in all races, and the amount of virtual cash used to buy a route would vary the
14 quality or speed of the route.

15 Game players would have the option of racing through their hometowns, or
16 through the streets of their favorite cities or countries all over the world. These would
17 attract a larger demographic, and interest the casual game player as well.

18
19 O. Virtual trip planner and simulation

20 Data that represents actual, real world places can be used for a computer
21 simulation application that would allow a user to preview a trip or specific route by
22 virtually driving it on his or her personal computer or game console. The simulation
23 would be based on a representation of the geographic database that included 3D
24 renderings of buildings, signs, topographical features, and other related attributes. The
25 simulation software could be provided on media, through an online vendor, or rented to
26 users on an as-needed basis. Users would enter a route request via their personal
27 computers or consoles and could use gaming steering wheels, joysticks, voice commands,
28 or keyboards to drive the routes. A fast forward function could be used to skip the
29 obvious or mundane sections of the trip or to speed up the pace.

1 To make the simulation more realistic, traffic features, such as vehicles coming
2 and going on the route, could be included. These could perhaps even be based on actual
3 traffic patterns or real-time traffic for a selected time of day.

4 A feature of this simulation application would be as a form of trip planner. The
5 planner would provide information about an area to which one is traveling, such as local
6 history, area specific trivia games, and point of interest descriptions and
7 recommendations. Users would have the option of using this information while driving
8 the area in advance (e.g., using the simulation application, described above), printing out
9 the planner in advance as a reference, or loading it onto a device and accessing it during
10 an actual trip (e.g., going on a long trip and using the planner interactively to keep
11 children amused and informed). For example, if a family was traveling on vacation from
12 Chicago to Miami by car, the parents could research and preview the attractions, hotels,
13 and restaurants at which the family may want to stop along the way. They could also
14 preview the route and create their own form of trip ticket to plan the best route. The
15 parents could then set up an itinerary that would include games, information, quizzes etc.,
16 that would occupy the children throughout the trip.

17
18 It is intended that the foregoing detailed description be regarded as illustrative
19 rather than limiting and that it is understood that the following claims including all
20 equivalents are intended to define the scope of the invention.